

BUREAU OF RECLAMATION
Technical Service Center
Denver, Colorado

TRAVEL REPORT

86-68460
PRJ-8.10

Codes: 86-68460, 86-68240

June 5, 2008

To: Manager, Hydraulic Investigations and Laboratory Services Group
Manager, Sedimentation and River Hydraulics Group

From: Tracy Vermeyen, Hydraulic Engineer, 86-68460,
Travis Bauer, Hydraulic Engineer, 86-68240

Subject: Nimbus Dam Tailwater Bathymetry Survey, American River, Central Valley Project

1. Travel period: April 15-17, 2008.
2. Places or offices visited: Nimbus Dam and Folsom, CA
3. Purpose of trip: To collect detailed bathymetry data in the American River below Nimbus Dam to support Fish Hatchery Weir Replacement
4. Synopsis of trip: On Tuesday afternoon Mr. Travis Bauer and I met with Mr. Mike Healey from the California Department of Fish and Game (CDFG) to outfit his boat with the ADCP and GPS equipment. Afterward, Mr. David Robinson (CC- 413) took us to view the temporary benchmark (TBM) on Nimbus Dam set by Regional surveyor Mr. Dave Mello. Mr. Mello provided the benchmark's northing, easting, and elevation based on the project datum (NGVD88 =2.34 ft), see table 1.

On Wednesday morning, Mr. Healey and I set up the boat for data collection (figure 1). Messrs. Bauer and Robinson set up the Trimble 5800 base station on the TBM at Nimbus Dam. After some initial problems with a loose cable on the ADCP, we began data collection at 9:00 a.m. Bauer and I calibrated the

Table 1. Temporary Benchmark information provided by MP Regional surveyor.

Northing (ft)	1,994,242.34
Easting (ft)	6,784,601.94
Elevation (ft)	134.07
Latitude (°)	38° 38' 08.07201"
Longitude (°)	121° 13' 10.28241"
Ellipsoid Height (ft) WGS 84	35.66

ADCP compass to correct for local magnetic variations attributed to the boat or equipment proximate to Nimbus Dam. We surveyed the Nimbus stilling basin apron and the American River downstream to the fish hatchery weir. Bathymetry data were collected as close as possible to the weir. GPS coverage was very good except for a few lost data points underneath the Hazel Avenue

Bridge. We completed the tailwater survey at 12:15 p.m. and moved the boat to Sailor Bar to survey the American River below the weir. We completed the lower reach survey at 2:45 p.m. We packed up our survey equipment and left the project at 4:00 pm. A cursory review of the data showed we collected approximately 30,000 bed elevation data points and 300 water surface elevation points over about 0.9 river miles. Bauer submitted a data file of base station position data to NOAA's Online Positioning User Service which calculated the TBM position (table 2).

Table 2. Temporary Benchmark information from Trimble GPS Base station (OPUS Solution)

Northing (ft)	1,994,242.20
Easting (ft)	6,784,602.05
Elevation (ft) geoid03 NAVD88	133.86
Latitude (°)	38° 38' 08.07069"
Longitude (°)	121° 13' 10.28112"
Ellipsoid Height (ft) WGS 84	35.45



Figure 1. Photograph of the boat with ADCP mounted off the starboard gunnel. Nimbus spillway is in the background.

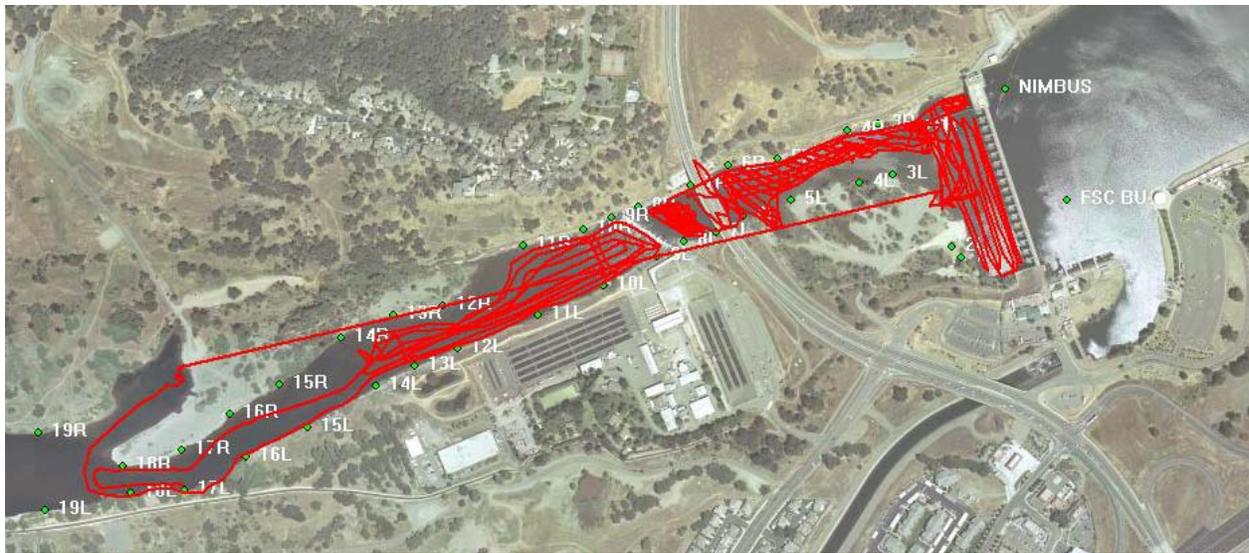


Figure 2. Aerial photograph with raw GPS tracks collected during April 16, 2008 bathymetry survey below Nimbus Dam. Note: Waypoints on the banks are transect locations from a previous survey.

Nimbus Dam Operations: Discharge from Nimbus Dam, as reported by USGS gaging station (USGS 11446500 AMERICAN R AT FAIR OAKS, CA) was steady at 1265 ft³/sec throughout the survey period. Five ADCP discharge measurements were made at cross sections established by Philip Williams and Associates in 2005. The average ADCP-measured discharge for the five transects was 1230 ft³/sec. The average ADCP discharge was -2.8 percent lower than the USGS flow, but is within the uncertainty of the measurement techniques. This close agreement between flow measurements is a good indication that the ADCP was functioning normally. During the bathymetric survey, a USGS hydrographer performed a discharge measurement from the cableway using a Price AA meter; the discharge was reported to be 1190 ft³/sec.

ADCP Configuration and Post Processing: The ADCP was configured to collect data in water mode 12 with 12 sub pings and a single bottom track ping. ADCP data were processed using a USGS utility program called ADMAP. Processing resulted in over 30,000 depth soundings, with 20,000 points located upstream of the weir and 10,000 points downstream. These data were processed by Travis Bauer to remove points collected during periods with poor GPS conditions (less than 5 visible satellites). The final data set will be used to produce contours of the bathymetry from the Nimbus Dam stilling basin downstream to Sailor Bar which is a distance of about 0.9 river miles.

A summary of the ADCP configuration parameters are as follows:

Depth of sensor (below surface): 0.20 m		Blanking Distance: 25cm
Compass correction 1°	Water Modes: 12 (high resolution)	Magnetic variation: 14.55° E
Firmware: v10.16	Beam Angle: 20°	Frequency: 1200 kHz
Orientation: Down	Pattern: Convex	Bin Size: 10 cm
Water Mode: WO12,4	Bottom Mode: 5	No. of Bins: 112
Pings/Ensemble: 12 sub pings water, 1 bottom		Sound Adsorption: 0.04 dB/ft
Intensity scaling factor: 0.43 dB/count		Salinity: 0.00 ppm

5. Conclusions: A high resolution hydroacoustic survey was successfully performed below Nimbus Dam to describe the bathymetry and three dimensional velocity fields. A Trimble RTK-GPS system was used to collect survey grade position and elevation data concurrently with ADCP data. The GPS setup on the TBM at Nimbus Dam was adequate to provide continuous coverage over the study reach. Processed bathymetry (x,y,z) data will be delivered to interested parties after the data has been peer reviewed. Support from the MP Regional and area office and the CDFG was very helpful and much appreciated.

6. Action correspondence initiated or required: Bathymetry data will be disseminated when it has been finalized and peer reviewed.

7. Client feedback received: None

cc: CC-413 (Robinson), MP-150 (Hannon), MP-222 (Reaves), M. Healey (mhealey@dfg.ca.gov), 86-68240 (Bauer), 86-68140 (Robertson, Wagner), 86-68460 (K. Frizell, Higgs)

Travelers: Tracy Vermeyen, 86-68460
Travis Bauer, 86-68240

SIGNATURES AND SURNAMES FOR:

Travel to: Nimbus Dam, Folsom, CA
Date or Dates of Travel: April 15-17, 2008

Names and Codes of Traveler's: Tracy Vermeyen, 86-68460
Travic Bauer, 86-68240

Traveler's:

Tracy Vermeyen
Hydraulic Investigations and Laboratory Services Group

Date

Travis Bauer
Sedimentation and River Hydraulics Group

Date

Peer Review by:

Joe Kubitschek
Hydraulic Investigations and Laboratory Services Group

Date

Noted and Dated by:

Cliff Pugh, Manager
Hydraulic Investigations and Laboratory Services Group

Date

TR-08-03

TRAVELERS: Tracy Vermeyen, 86-68460
Travis Bauer, 86-68240

SUBJECT: Trip Report – Nimbus Dam Tailwater Bathymetry
Survey, American River, Central Valley Project

TRAVEL PERIOD: April 15 - 17, 2008

PLACES VISITED: Nimbus Dam and Folsom, California